

What is claimed is:

Claims:

- 1 1. A method for mass producing carbon nanotubes, comprising:
2 synthesizing a plurality of carbon nanotubes to a first length on a plurality of
3 synthesis sites carried by a first substrate;
4 interrupting the synthesis of the plurality of carbon nanotubes;
5 supporting a free end of each of the plurality of carbon nanotubes from a
6 second substrate;
7 separating the plurality of synthesis sites from the first substrate; and
8 resuming the synthesis of the plurality of carbon nanotubes at the plurality of
9 synthesis sites to lengthen the plurality of carbon nanotubes to a second length that is
10 greater than the first length.
- 1 2. The method of claim 1 wherein supporting the free end comprises:
2 covering the plurality of synthesis sites and the plurality of carbon nanotubes
3 with a layer having opposed first and second surfaces;
4 bonding the first surface of the layer to the second substrate; and
5 recessing the second surface of the layer to a depth sufficient to expose an
6 interface between each of the plurality of carbon nanotubes and a corresponding one
7 of the plurality of synthesis sites.
- 1 3. The method of claim 2 wherein each of the plurality of carbon nanotubes
2 includes a leading tip, and recessing the layer comprises:
3 limiting the recessing of the layer such that the leading tip of each of the
4 plurality of carbon nanotubes remains submerged in the layer.
- 1 4. The method of claim 1 wherein each of the plurality of synthesis sites includes
2 a seed pad of a catalyst material capable of supporting the synthesis of carbon
3 nanotubes.

1 5. The method of claim 4 wherein synthesizing the plurality of carbon nanotubes
2 comprises:
3 supplying a reactant at an interface between the seed pad of each of the
4 plurality of synthesis sites and the corresponding one of the plurality of carbon
5 nanotubes.

1 6. The method of claim 5 interrupting the synthesis comprises:
2 discontinuing the supplying of the reactant to the interface.

1 7. The method of claim 5 wherein resuming the synthesis of the carbon
2 nanotubes comprises:
3 supplying a reactant to the interface.

1 8. The method of claim 3 further comprising:
2 surrounding the seed pad of each of the plurality of synthesis sites with a
3 spacer that prevents nanotube synthesis substantially parallel to a plane containing the
4 first substrate.

1 9. The method of claim 1 wherein separating the plurality of synthesis sites from
2 the first substrate comprises:
3 manipulating a release layer positioned between the first substrate and the
4 plurality of synthesis sites to precipitate release of the first substrate.

1 10. The method of claim 1 further comprising:
2 preventing lateral nanotube synthesis in a horizontal plane containing the first
3 substrate such that each of the plurality of carbon nanotubes has a substantially
4 vertical orientation relative to the horizontal plane containing the first substrate.

- 1 11. The method of claim 10 wherein preventing lateral nanotube synthesis
2 comprises:
3 surrounding each of the plurality of synthesis sites with a spacer that prohibits
4 lateral nanotube synthesis.
- 1 12. The method of claim 1 wherein a single carbon nanotube is carried by each of
2 the plurality of synthesis sites.
- 1 13. The method of claim 1 further comprising:
2 forming the plurality of synthesis sites on the first substrate.
- 1 14. The method of claim 1 wherein each of the plurality of synthesis sites is sized
2 to support the synthesis of one of the plurality of carbon nanotubes.
- 1 15. The method of claim 1 wherein synthesizing the plurality of carbon nanotubes
2 comprises:
3 performing a chemical vapor deposition process at the plurality of synthesis
4 sites.
- 1 16. The method of claim 16 wherein each of the plurality of synthesis sites
2 includes a seed pad of a catalyst material capable of supporting the synthesis of the
3 plurality of carbon nanotubes.
- 1 17. The method of claim 16 wherein performing the chemical vapor deposition
2 process comprises:
3 supplying a reactant to the seed pad that is catalyzed by the catalyst material to
4 synthesize the plurality of carbon nanotubes.

1 18. The method of claim 1 wherein resuming the synthesis of the plurality of
2 carbon nanotubes comprises:
3 performing a chemical vapor deposition process at the plurality of synthesis
4 sites.

1 19. The method of claim 18 wherein each of the plurality of synthesis sites
2 includes a seed pad of a catalyst material capable of supporting the synthesis of the
3 plurality of carbon nanotubes.

1 20. The method of claim 19 wherein performing the chemical vapor deposition
2 process comprises:
3 supplying a reactant to the seed pad that is catalyzed by the catalyst material to
4 synthesize the plurality of carbon nanotubes.

1 21. The method of claim 1 wherein said plurality of carbon nanotubes are multi-
2 wall carbon nanotubes.

1 22. The method of claim 1 wherein said plurality of carbon nanotubes have a
2 substantially uniform length.

1 23. The method of claim 1 wherein supporting the free end comprises:
2 covering the plurality of synthesis sites and the plurality of carbon nanotubes
3 with a first layer and a second layer;
4 bonding the second layer to the second substrate; and
5 removing the first layer selective to the second layer to a depth sufficient to
6 expose the plurality of synthesis sites.

- 1 24. The method of claim 23 further comprising:
2 removing the first layer to a depth sufficient to expose a free end of each of the
3 plurality of carbon nanotubes before the second layer is formed on the first layer, such
4 that the free end of each of the plurality of carbon nanotubes is embedded in the
5 second layer.
- 1 25. The method of claim 24 wherein removing the first layer shortens a length of
2 at least one of the plurality of carbon nanotubes.

- 1 26. A structure comprising:
2 a substrate;
3 a plurality of carbon nanotubes each extending between a first end coupled
4 with said substrate and a second end; and
5 a plurality of synthesis sites each coupled with the second end of a
6 corresponding one of the plurality of carbon nanotubes.
- 1 27. The structure of claim 26 wherein each of the plurality of synthesis sites is
2 sized to support the synthesis of a single carbon nanotube.
- 1 28. The structure of claim 26 wherein each of said plurality of carbon nanotubes is
2 carried by a corresponding one of the plurality of synthesis sites.
- 1 29. The structure of claim 26 where said substrate further comprises:
2 a layer covering the plurality of synthesis sites and the plurality of carbon
3 nanotubes, said layer having a first surface bonded with said substrate and a second
4 surface.
- 1 30. The structure of claim 29 wherein said first end of said plurality of carbon
2 nanotubes is buried within said layer.
- 1 31. The structure of claim 29 wherein said second surface of said layer is recessed
2 to a depth sufficient to expose the plurality of synthesis sites.
- 1 32. The structure of claim 26 wherein said plurality of carbon nanotubes are multi-
2 wall carbon nanotubes.
- 1 33. The structure of claim 26 wherein said plurality of carbon nanotubes have a
2 substantially uniform length.